Integrating emerging technologies with biomass refining

Elankovan Ponnampalam*, Director of Bioprocess Engineering
MBI International
3900 Collins Road, P.O. Box 27609
Lansing, MI 48909-0609
Fax: 527-337-2122; Ponnampalam@mbi.org

MBI is evaluating the technical and economical feasibility of developing biobased technologies that could reduce the cost of ethanol production. The major goal is to evaluate and demonstrate technologies that will provide adequate profit margins for dry mill ethanol producers and eliminate the need for federal subsidies to be profitable. This includes the production of value-added products from current byproducts or waste products. This program is expected to improve the corn-to-ethanol economy and increase profits for the farm-based economy. MBI has targeted the grain processing industry as a valuable conduit to achieve large-scale commercialization of biomass conversion to energy. This industry provides processing expertise, infrastructure, capital resources, market relationships and the management expertise needed to develop a large biomass to energy program. They are also located adjacent to the largest and most highly concentrated source of biomass in the United States.

MBI is evaluating the feasibility of the production of high value co-products from the corn-to-ethanol production process by integrating new processing steps to separate different components of the corn. High value co-products under evaluation include corn oil (via the "Quick Germ" separation process), nutraceutical fiber oil (extracted from corn fiber), xylitol (separating xylose from corn fiber and converting xylose to xylitol or ethanol), succinic acid and succinic acid derivatives and potential chiracl compounds from from cellulose derived sugars.

Integrating a degermination process is the key to unlocking a number of potential value-added products from corn. Degermination is expected to accomplish two primary goals, 1) increase ethanol production and 2) remove the germ which would be a contaminant in other value added products such as fiber oil and other sugars. The degermination process is necessary to facilitate the value-added process steps that follow in Figure 1 Phase I.

Phase II will produce additional products such as fiber oil (a nutraceutical) from corn fiber and xylose and arabinose from corn fiber hydrolyzate. The xylose will be used to produce xylitol. Xylitol is a value-added product that prevents tooth decay and is also used as diet filler and sweetener. It has many other valuable uses. Arabinose will be used to produce chiral compounds that will be used as intermediates or building blocks for drug manufacturing.

Phase III is the integration of ethanol and succinic acid production where the CO_2 released from the ethanol production will be used to produce succinic acid. The CO_2 will be prevented from being released and the resulting mass will be used for corn-to-ethanol and succinic acid production.

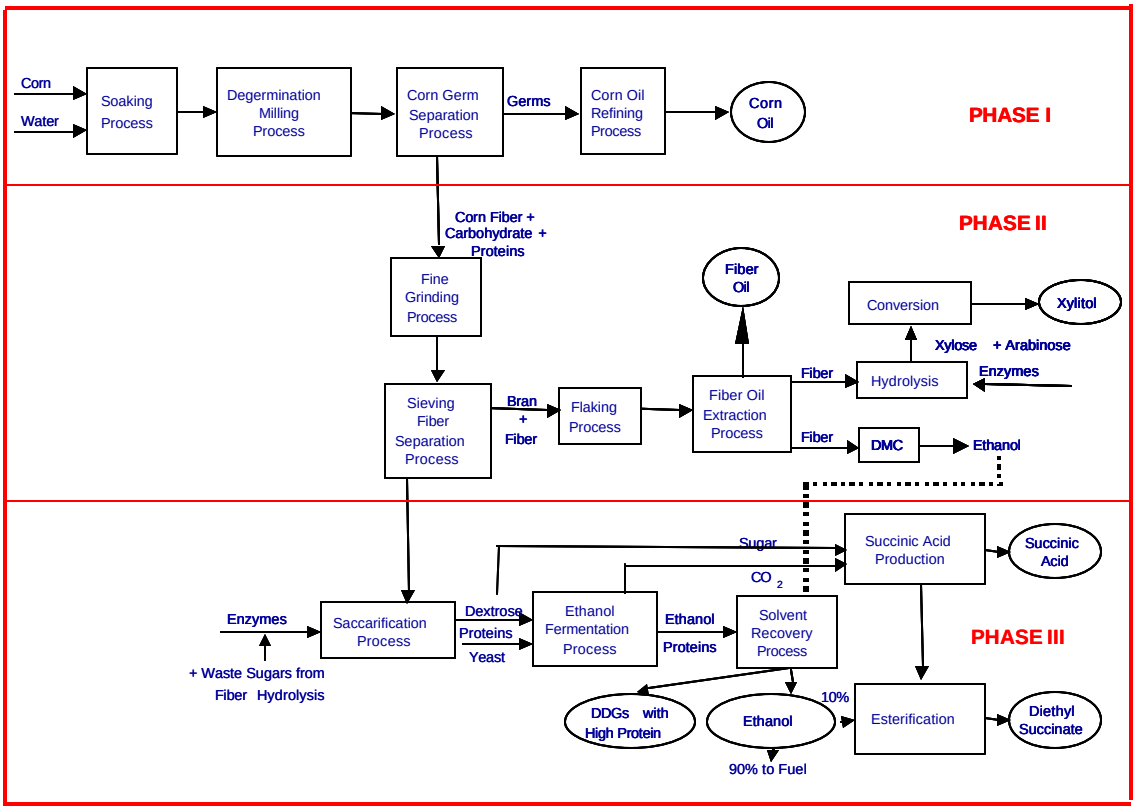

Figure 1. Total Process Flow Diagram for Value-Added Products in the Corn Ethanol Industry

Figure 2 shows the speciality and commodity chemicals that could be produced from biomass via succinic acid. The succinic acid platform has the potential to replace the chemical productions from petroleum based raw materials to biobased raw materials. This process enhances the U.S. economic security through renewable crop and biobased resource use. According to USDA studies that ethanol production adds $0.20-0.30 to every bushel of corn, with this value added product, integration will add more to the farmers and rural communities across America.

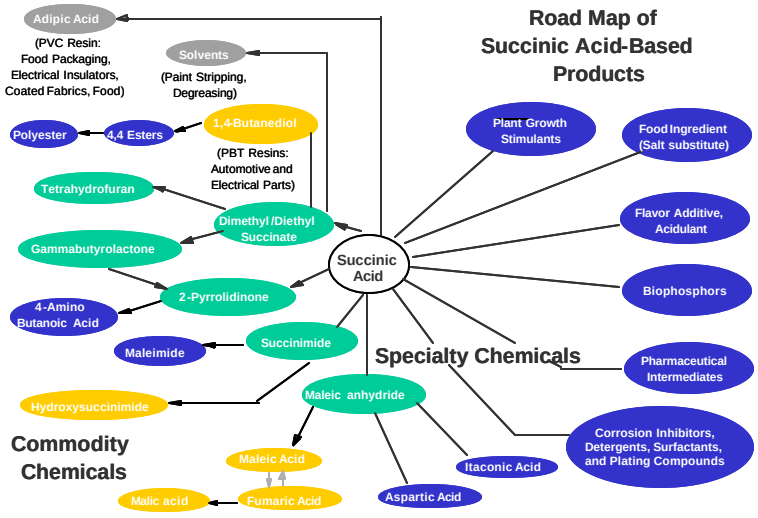

Figure 2. Succinic Acid Product Roadmap